



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/727,764	12/03/2003	H. Grant Wang	03-0041 BOE-63(1)	7578
55132 7590 10/04/2007 WILDMAN HARROLD ALLEN & DIXON LLP AND THE BOEING COMPANY 225 W. WACKER DR. CHICAGO, IL 60606			EXAMINER DINH, TIEN QUANG	
			ART UNIT 3644	PAPER NUMBER
			MAIL DATE 10/04/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/727,764	Applicant(s) WANG ET AL.	
	Examiner Tien Dinh	Art Unit 3644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 2, 4-15, 17-21, 23, 24, 27, 35 and 36 is/are pending in the application.
- 4a) Of the above claim(s) 6-15 and 18-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 4, 5, 21, 23, 24, 27, 35, 36 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 35 and 36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant claims attitude sensor set “consisting” of at predetermined number of star trackers and at least one gyro device.” This seems to contradict the term consisting. It is not known how many star trackers there are and how many gyro devices. See claims 35 and 36.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 2, 4, 5, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosick 6032904 in view of Bezooijen 5745869.

Hosick et al discloses a satellite having an in-space thrust system having a pair of electric thrusters for orbit raising (transfer orbit), station keeping (on-station operations) and unloading momentum wheels. The satellite has an attitude controller that receives attitude information

Art Unit: 3644

from the onboard sensor suite 32. The controller compares the sensor input with the desired attitude provides to implement satellite movement control. Onboard sensor suite 32 comprises gyroscope (34) an earth sensor, a sun sensor and a star sensor (see Col. 6, lines 56-65). The plurality of sensors in the sensor suite 32 is used for transfer orbit operations and on-station operations. The star tracker can determine spacecraft spin rate and attitude since the rotation about targeted stars as a function of time determines the spin rate. The relative location of the satellite with respect to targeted stars determines the attitude. The gyro 34 is also capable of being used to determine spacecraft spin rate and attitude. A person skilled in the art would know this.

Although Hosick et al teaches that one of the primary objects of the present invention is to reduce the dependencies of chemical and liquid motors (i.e. bi-propellant) in favor of electric motors, Hosick never-the-less teaches that it is known in the art to use bi-propellant liquid motors for orbit transfer maneuvers. Therefore while Hosick et al teaches that electric motors are preferred especially for his invention, he does not teach completely away from using liquid bi-propellant motors.

Inherently any controller has “electronic equipment” and “software”. Controllers are programmable electrical devices. Hence since the controllers have software, the processor determines the attitude/spin rate, acceleration of the spacecraft.

Hosick does not teach the capability of being able to determine attitude from a single sensor input.

Bezooijen teaches A detector (13), camera electronics (14), and computer (15) located on board the spacecraft (1) are used to generate a set of star match groups by matching pairs of stars

Art Unit: 3644

observed by the detector (13) with pairs of guide stars from a stored database (18) of guide stars. The present invention is used for determining the attitude of a spacecraft 1 by means of sensing stars 2. It can be embodied in an autonomous star tracker, such as the Autonomous Star Tracker (AST) 10 being developed by Lockheed Palo Alto Research Laboratory in anticipation of the need for smart sensors capable of supporting autonomous, long-duration, space flight missions.

Detector 13 can be any type of sensor that measures intensity and position of objects in field of view 20, including an ICD or an active pixel sensor (APS). Attitude determination module 7 is then invoked to convert the position of the matched stars into the attitude of AST 10.

It would have been obvious to determine attitude from the input of a single detector or a set of the same detector (such as star trackers for redundancy), as taught by Beooijen for the purpose of increasing reliability of the system.

3. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hosick as modified by Bezooijen, as applied to claim 1 above, and further in view of the BOEING 702 fleet (publicly announced in October 1995, and launched in 1999). Hosick does not specifically disclose what the liquid motors are used for. However it has been known since at least October 1995 that satellites can combine electric, bi-propellant (liquid) and chemical engines for controlling the operations of a satellite. The BOE-702 satellites employ XIPS for final orbit insertions; liquid (bi-propellant) engines for lift the satellite into final orbit (orbit transfers). It would have been obvious to use the engines of the BOE 702 fleet on the thruster mounting configuration of Hosick for the purpose increasing versatility and maneuverability. (Alternatively the examiner could have rejected claims 1 and 17 over BOE702 in view of Hosick, where Hosick teaches that on-station and orbit transferring method steps).

4. Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosick as modified by Bezooijen, as applied to claim 1 above, in view of Baghdasarian (6,010,096). Hosick does not disclose deployable solar arrays. Baghdasarian discloses that it is well known in the art to have solar arrays, which are deployable. (See Col. 3, lines 60+). It would have been obvious to one having ordinary skill in the art, at the time the invention was made to employ deployable solar wings for the purpose of reducing the area required for transporting the satellite to space (allowing it to fit within the payload bay of a shuttle).

Claims 27, 35, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosick in view of Bezooijen and Needelman 6266616.

Hosick in view of Bezooijen disclose all claimed parts (see the rejections in paragraph 2 above) but are silent on using more than one star tracker/sensor. However, Needelman teaches that the use of multiple star trackers (see abstract) is well known. One skilled in the art would have used more than one star sensor in Hosick's system as taught by Needleman for redundancy and to verify the readings. Please note that since there is more than one star sensor in the sensor set, the processor would take in input from the start sensors. This leads to redundancy and data check. For example, if one star sensor was to fail, another sensor is there to provide attitude data to the processor. Plus, since there is more than one star sensor, one sensor's data can be checked with another to verify that the data match.

Response to Arguments

Art Unit: 3644

The examiner thanks the applicant for the response. However, the combination of prior arts used in the rejection is indeed valid, especially in light of the new KSR v. Teleflex decision from the Supreme Court. The predictable result of using more than one star trackers leads to redundancy and data check. The examiner has used new art to reject the claims. This renders applicant's arguments moot.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Li et al, Needleman et al 6470270, and Izumida et al teach star trackers.

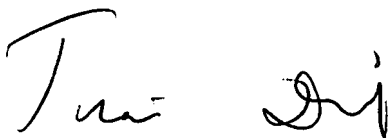
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tien Dinh whose telephone number is 571-272-6899. The examiner can normally be reached on 9-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Teri Luu can be reached on 571-272-7045. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 3644

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TD

A handwritten signature in cursive script, appearing to read "Tim Di".